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100-1 FORM 18-11-62

Q4335

SPECIFICATION

1 of 1

1. COMPONENT/PART NAME PER GENERIC CODE	Ignition Parts and Explosives, Rocket Ignition-Solid, Squib Pyrotechnics, Electrical	2. PROGRAM OR WEAPON SYSTEM	Multiple	3. DATE OF: DAY MO. YR.
4. ORIGINATOR'S SPECIFICATION TITLE	Description & Requirements For Squib, Electrical, Mark 5 Mod 0	5. ORIGINATOR'S SPEC. NO.	OS11637	ISSUE 29 10 62
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7. THIS SPECIFICATION COMPLEMENTS REPORT NO:				

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NO. 415 20 60 40-XT-01

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OS 11637
CODE IDENT. 10001

DESCRIPTIONS AND REQUIREMENTS

FOR

SQUIB, ELECTRIC, MARK 5 MOD 0

BUREAU OF NAVAL WEAPONS

DEPARTMENT OF THE NAVY

APPENDIX
John Solder
29 Oct 62

RECORD OF REVISIONS

REVISION LETTER	DATE	CHANGES

THIS DOCUMENT CONSISTS OF PAGES 1 TO 11
and 1 TO 14 INCLUSIVE.

FSC

1163-10001-10001 (3-61)

- Ser 01376 - 1 Nov 1962 -

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OS 11637
Code Ident 10001

**DESCRIPTIONS AND REQUIREMENTS
FOR
SQUIB, ELECTRIC, MK 5 MOD 0**

1. SCOPE.

Report presents the description of, and requirements for,

1.1.1 This publication covers one type of double-bridge, ceramic-insulated, explosive-loaded assembly, referred to herein as the squib. ()

2. APPLICABLE DOCUMENTS.

2.1 The following documents of the issue in effect on the date of invitation for bids form a part of this publication to the extent specified herein.

SPECIFICATIONS

Federal

P2P-B-621

**Boxes, Wood, Nailed and
Lock-Corner.**

Military

MIL-P-116

Preservation. Methods of.

MIL-B-131

Barrier Material, Water Vaporproof, Flexible.

MIL-E-5272

Environmental Testing, Aero-
nautical and Associated Equip-
ment, General Specification
for.

FSC 1340

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STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	Marking for Shipment and Storage.
MIL-STD-350	Jolt Test for Use in Production of Fuzes.
MIL-STD-351	Jumble Test for Use in Production of Fuzes.
MIL-STD-354	Temperature and Humidity Test for Use in Production of Fuzes.
MIL-STD-358	Five-Foot Drop Test for Use in Production of Fuzes.
MIL-STD-414	Sampling Procedures and Tables for Inspection by Variables for Percent Defective.

DRAWINGS

Bureau of Naval Weapons
(Code Ident 10001)

LD 269495	Squib, Electric, Mk 5 Mod 0, Loaded Assembly.
563246	Signal Container, Mk 3 Mod 0.

(Copies of documents required by suppliers in connection with specific procurement functions should be obtained from the procuring activity, or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this publication to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids shall apply.

Code of Federal Regulations

49 CFR 71-78

Interstate Commerce Commission
Rules and Regulations for the
Transportation of Explosives
and Other Dangerous Articles.

(The Interstate Commerce Commission Regulations are now a part of the Code of Federal Regulations and are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Orders for the above publication should cite "the latest issue and supplements thereto.")

3. REQUIREMENTS.

3.1 Preproduction sample. Unless otherwise specified in the contract or order, a preproduction sample consisting of 125 squibs shall be delivered to the activity designated in the contract or order. The preproduction sample shall be manufactured using the methods proposed for production and shall be tested in accordance with Section 4. Any production by the supplier prior to acceptance of the preproduction sample shall be at the supplier's risk.

3.2 Compliance with documents. Unless otherwise specified, the squib shall be in accordance with the requirements specified herein and the applicable documents listed in LD 269495.

3.3 Performance and product characteristics.

3.3.1 Bridge resistance and continuity. When tested in accordance with 4.5.1, the bridge circuit shall be continuous and shall have a resistance value of 0.5 to 0.9 ohm.

3.3.2 No-fire sensitivity. When tested in accordance with 4.5.2, the squib shall not be initiated and neither bridge shall burn out.

3.3.3 Firing time. When tested in accordance with 4.5.3, the firing time for the squib shall be not greater than 20 milliseconds.

3.3.4 Output. When tested in accordance with 4.5.4, the squib shall produce (in the test block) a cavity having a volume of 15 to 50 cubic centimeters (cc). The test block shall be polystyrene foam having a density of 1.45 to 1.75 pounds per cubic foot. See figure 1.

3.4 Environmental requirements.

3.4.1 Jolt. The squib shall be safe to handle and dispose of and no explosive element shall initiate during or as a result of the test specified in Standard MIL-STD-350.

3.4.2 Jumble. The squib shall be safe to handle and dispose of and no explosive element shall initiate during or as a result of the test specified in Standard MIL-STD-351.

3.4.3 Five-foot drop. The squib shall be subjected to the five-foot drop test specified in Standard MIL-STD-358 and thereafter shall meet the requirements of 3.3.

3.4.4 Vibration. The squib shall be subjected to vibration in accordance with Specification MIL-E-5272, Procedure XII and thereafter shall meet the requirements of 3.3.

3.4.5 Temperature and humidity. The squib shall be subjected to temperature and humidity in accordance with Standard MIL-STD-354 and thereafter shall meet the requirements of 3.3.

3.5 Workmanship. The squib shall be free from explosive materials on all external surfaces. It shall be uniform in quality and free from foreign materials.

4. QUALITY ASSURANCE PROVISIONS.

4.1 The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of examination and tests shall

be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in this publication where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements.

4.1.1 Acceptance. Authority and responsibility for acceptance shall rest with the cognizant Government representative.

4.2 Preproduction sample. The preproduction sample shall conform to the requirements of 3.1. Failure to meet these requirements shall be cause for rejection of the preproduction sample and shall be cause for cancellation of the contract or order.

4.3 Lot. Except as otherwise specified herein, or in the contract or order, lot definition, formation and size shall be as specified in Standard MIL-STD-105.

4.4 Sampling. The following provisions shall govern the establishment of sampling plans and procedures for inspection, acceptance and rejection:

- (a) Standard MIL-STD-105 for attributes.
- (b) Standard MIL-STD-414 for variables.

4.5 Acceptance tests.

4.5.1 Bridge resistance and continuity. The bridge resistance and continuity of every squib in every lot, including the preproduction sample, shall be measured. Any precision resistance measuring instrument, having an output current not greater than 50 milliamperes dc may be used. Each squib that fails to meet the requirement of 3.3.1 shall be rejected.

4.5.2 No-fire sensitivity. The squib bridge circuit shall be energized with 680 to 720 milliamperes dc for a period of not less than 10 seconds. Any failure to meet the requirement of 3.3.2 shall result in rejection of the lot. The samples used for this test shall not be delivered to the Government as part of production, but may be used for the tests of 4.5.3 and 4.5.4.

4.5.3 Firing time. Divide the sample into three equal groups, or as nearly equal as the sampling plan permits. Temperature condition the groups for not less than two hours as follows:

- (a) Group 1 at minus 60 to minus 70 degrees Fahrenheit (°F).
- (b) Group 2 at plus 65 to plus 75 degrees F.
- (c) Group 3 at plus 160 to plus 170 degrees F.

Remove the squibs from the chamber singly and install each squib in the test fixture of figure 1. A direct current of 3.0 to 3.3 amperes shall be applied to the squib. Each squib shall be test fired within three minutes after removal from the chamber.

4.5.3.1 Acceptance criteria. Using the values specified in 3.3.3, the lot represented shall be judged in accordance with Standard MIL-STD-414, variability unknown, standard deviation method, single specification limit, Acceptable Quality Level (AQL) 0.65 percent defective.

4.5.4 Output. The squib output shall be evaluated by measuring the cavity formed in the polystyrene-foam block. The cavity volume shall be determined as follows:

- (a) Place a straight edge across the cavity opening.
- (b) Fill the cavity with water until the water contacts the straight edge. Water shall not leak through the block.
- (c) The number of cubic centimeters of water required to fill the cavity shall be considered the volume of the cavity.

4.5.4.1 Acceptance criteria. Using the values specified in 3.3.4, the lot shall be judged in accordance with Standard MIL-STD-414, variability unknown, standard deviation method, double specification limit, AQL 0.65 percent defective.

4.6 Preproduction and product verification tests. These tests shall be conducted on the preproduction sample (see figure 2) and on each rejected lot resubmitted for acceptance. In addition, the Government reserves the right, any time during production, to test random samples for product verification (see figure 2).

4.6.1 Performance and product characteristics test. Fifty squibs from the preproduction sample shall be subjected to the tests specified in 4.5.2 through 4.5.4. The tests specified in 4.5.3 and 4.5.4 shall be combined into one test (see figure 2). Failure of any squib from the preproduction sample to meet the requirements of 3.3.2 through 3.3.4 shall be cause for rejection of the preproduction sample.

4.6.2 Jolt. Subject 12 squibs to the jolt test of Standard MIL-STD-350. The lot represented shall be rejected if any squib fails to meet the requirements of 3.4.1.

4.6.3 Jumble. Subject 12 squibs to the jumble test of Standard MIL-STD-351. The lot represented shall be rejected if any squib fails to meet the requirements of 3.4.2.

4.6.4 Five-foot drop. Subject 12 squibs to the five-foot drop test of Standard MIL-STD-353. The lot represented shall be rejected if any squib fails thereafter to meet the requirements of 3.4.3.

4.6.5 Vibration. Subject 12 squibs to the vibration test of Specification MIL-E-5272, Procedure XII. The lot represented shall be rejected if any squib fails thereafter to meet the requirements of 3.4.4.

4.6.6 Temperature and humidity. Subject 12 squibs to the test of Standard MIL-STD-354. The lot represented shall be rejected if any squib fails thereafter to meet the requirements of 3.4.5.

4.7 Workmanship. Visual examination shall be made to determine compliance with the requirements of 3.5. Failure of the squib to comply shall be cause for rejection.

4.8 Packaging, packing and marking. Packaging, packing and marking of the squib shall conform to the requirements of Section 5.

5. PREPARATION FOR DELIVERY.

5.1 Preservation and packaging.

5.1.1 Level A. In addition to detailed requirements herein and in applicable referenced documents, Level A preservation and packaging shall be in accordance with the Code of Federal Regulations 49 CFR 71-78.

5.1.1.1 Unit packaging. The squibs shall be packaged in a Signal Container, Mk 3 Mod 0, drawing 563246 in accordance with Specification MIL-P-116, Method IID.

5.2 Packing.

5.2.1 Level A. In addition to detailed requirements herein and in applicable referenced documents, Level A packing shall be in accordance with the Code of Federal Regulations 49 CFR 71-78.

5.2.1.1 Exterior containers. When applicable, not less than four Signal Containers, Mk 3 Mod 0 shall be packed for shipment in boxes conforming to Specification PPP-B-621. Boxes specified in Specification PPP-B-621 shall be provided with liners conforming to the requirements of Specification MIL-B-131.

5.3 Marking.

5.3.1 Special markings. Marking of the exterior containers shall be in accordance with the Code of Federal Regulations 49 CFR 71-78.

5.3.2 Normal markings. In addition to the marking required by contract or order, shipping containers shall be marked in accordance with the requirements of Standard MIL-STD-129.

6. NOTES.

6.1 Intended use. The squib is intended for use as a part of the ignition system for rocket motor propellants or any other use deemed appropriate and applicable.

6.2 Ordering data. Procurement documents should specify:

- (a) Title, number and date of this publication.
- (b) Preproduction sample (see 3.1).

- (c) Facility designated to evaluate the preproduction sample.
- (d) Invocation of Specification MIL-Q-9858.

6.3 Definitions.

- (a) Firing time. The total elapsed time, expressed in milliseconds, from the application of firing current until the squib fires.
- (b) For definition of preservation, packaging and packing levels refer to Federal Standard No. 102.

6.4 General safety precautions. The loading, assembly and handling of the item covered by this publication, and the subassemblies thereof, involve hazardous operations and therefore require suitable explosives safety precautions. Use of this publication will not be construed as to relieve the supplier or manufacturer of responsibility for the safety of his operations. Listed below are certain minimum provisions which a supplier or manufacturer (which exclusively loads the item covered) should observe in order to fulfill his responsibility for safety. At Bureau of Naval Weapons, Navy Department, and other Government plants, these provisions are mandatory. Such other warnings and precautions, pertinent to the operational effectiveness or safety during use or loading of the specified item, are included in the detail technical requirements of the publication.

6.4.1 All loading operations should be conducted in a neat and orderly manner.

6.4.2 Safe equipment and methods should be utilized for transporting and handling explosives and loaded parts. Where required, remote control barricaded handling equipment shall be used for explosives operations, such as mixing, pouring, weighing, charging, sifting, drying, pressing, casting, crimping, etc.

6.4.3 Personnel handling detonators, primers, delay elements, lead-ins, boosters, and related parts which affect functioning, should insofar as practicable, avoid using bare fingers or improper equipment in order to prevent damage, corrosion, or deterioration from perspiration or other contaminating deposits.

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6.4.4 The exposure of explosive materials and related parts should be so controlled as to minimize the absorption of moisture from the atmosphere or other sources during loading and handling operations.

6.4.5 All explosives and completely or partially loaded items should be stored in suitable storage magazines located in accordance with the American Table of Distances (ATD) or other applicable safety standards; and, while in process, in safety lockers and chests if in loading rooms, or in adequate ready or service magazines located in accordance with intraplant distances when outside of loading rooms. For Navy managed explosives loading plants, the provisions of the Armed Services Explosives Safety Board covering quantity-distance relations for explosives will apply.

6.4.6 Proper care must be exercised at all times to protect personnel from accidents, fires or explosions, and to limit damage to equipment and loading areas. In this connection, the precautionary measures in the following paragraphs should be observed.

6.4.6.1 Employ properly proportioned and properly located protective barricades, screens or shields at all required points.

6.4.6.2 Keep only minimum limited quantities of explosives and completed or partially loaded parts present at each stage of operation.

6.4.6.3 Keep explosives and explosive parts in approved covered receptacles with covers in place when material is not being taken out of or put into the receptacles. Where necessary, receptacles should be conductive to ground electrostatic charges.

6.4.6.4 Protect operations from electrostatic charges by effectively grounding all machinery, equipment, and fixtures; and, where necessary, employ suitable grounded conductive coverings for floors, work benches and tables, and workers' conductive shoes. Workers' clothing of a type to minimize the accumulation of static charges should be employed. Fabrics such as silk and nylon, which promote

static generation should be avoided. Additional grounding devices such as grounded bracelets for workers should be employed where operations are conducted with items which are unusually sensitive to initiation by static electricity. Such items include initiating explosives, tracer mixtures, and low-energy type electric primers, detonators and squibs. The latter types of items should have the free ends of lead wires bared and twisted together, and be packed in relatively small groups wrapped in bare non-insulated aluminum foil or other uncoated metal foil. During assembly and processing operations such sensitive electric items should be short circuited by clips or other devices until installed with safety shunt in the final device. Additional precautions for these items should include mechanical shielding to contain or deflect fragments and blast, also electrical shielding of these items from induced electric currents generated by sources such as lightning, static, radiations from communications apparatus, radar, or high frequency heat apparatus, etc. Where necessary for safety, humidity of work rooms should be appropriately increased, as required to lessen electrostatic effects but without inducing excessive moisture absorption by any of the components of the item being loaded.

6.4.6.5 Protect all explosive operations from effects of electric current originating from equipment such as soldering irons, heaters, switches, wiring, motors, lights, test instruments, etc., by suitable insulation, grounding separation or shielding. Such electric sources may initiate explosives by heat, sparks, arcs, or due to completing an electric circuit through an electric primer, detonator, or squib. Circuits may be inadvertently completed, for example, from a defective electric soldering iron through a grounded contact. All electric type primers, detonators or squibs provided with wire leads should have the free ends of the wires bared and twisted together to short circuit each unit, except when in process of assembly into a finished item. Where practicable, removable short circuiting clips, or other devices should be employed during manufacturing operations involving electric primers, detonators or squibs.

6.4.6.6 Enforce, where necessary, the wearing of suitable safety footwear, gloves, goggles, respirators, and impregnated garments to protect personnel against burns, poisoning and associated industrial hazards.

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6.4.6.7 Allow no fires or exposed electrical or other sparking equipment, and little or no flammable material to be present in loading, handling and storage spaces. Enforce proper "Match" and "No Smoking" rules where necessary.

6.4.6.8 Enforce good housekeeping and maintain effective policing, inspection and supervisory methods throughout the loading area and surroundings. Employ effective cleaning methods periodically to minimize the accumulation of explosives and explosive dust and other contamination upon, and assure its removal from floors, walls, ceilings, ledges, tables, benches, piping, and equipment or the items loaded; also, clean up any spilled material immediately.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government therby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be construed by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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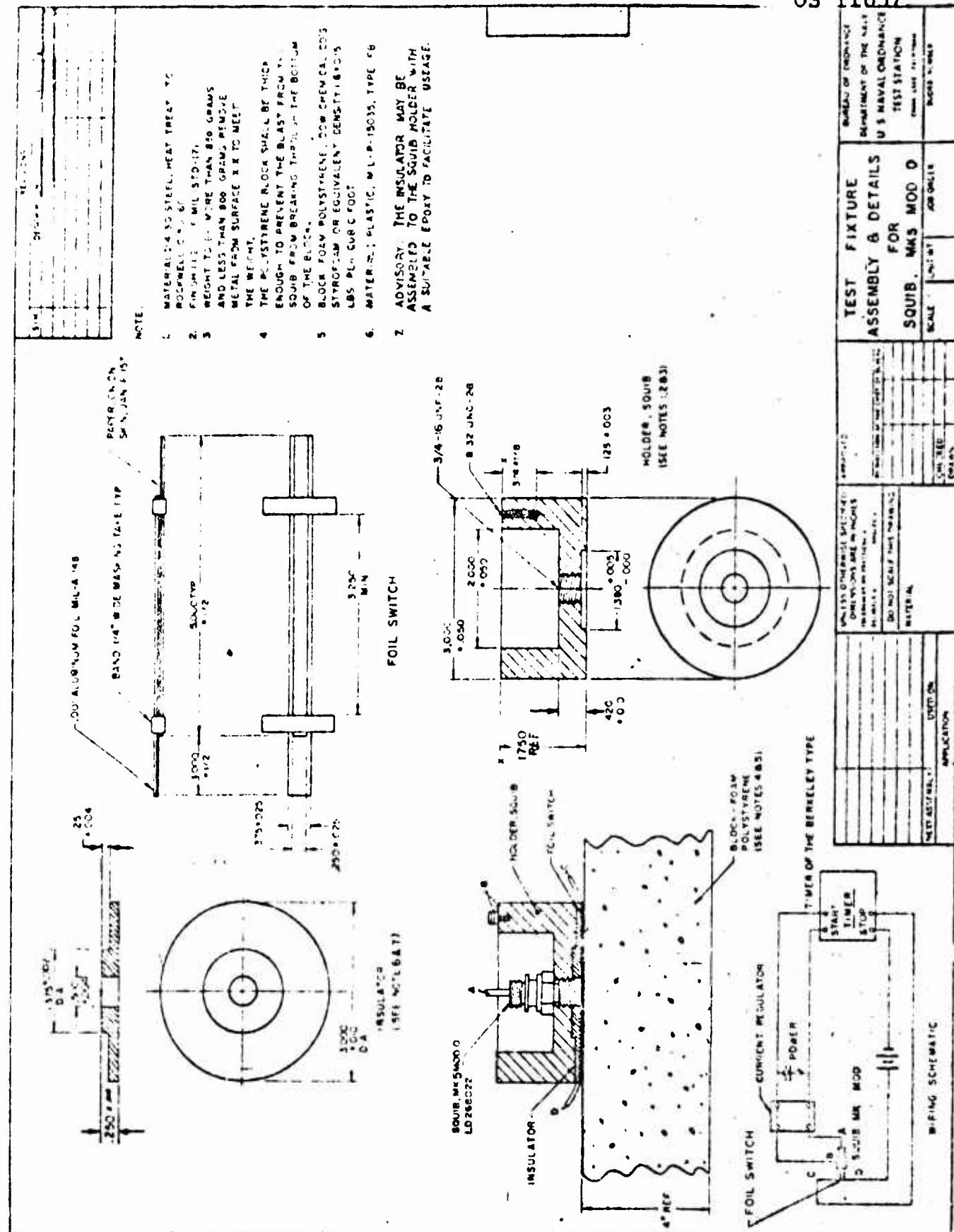


Figure 1

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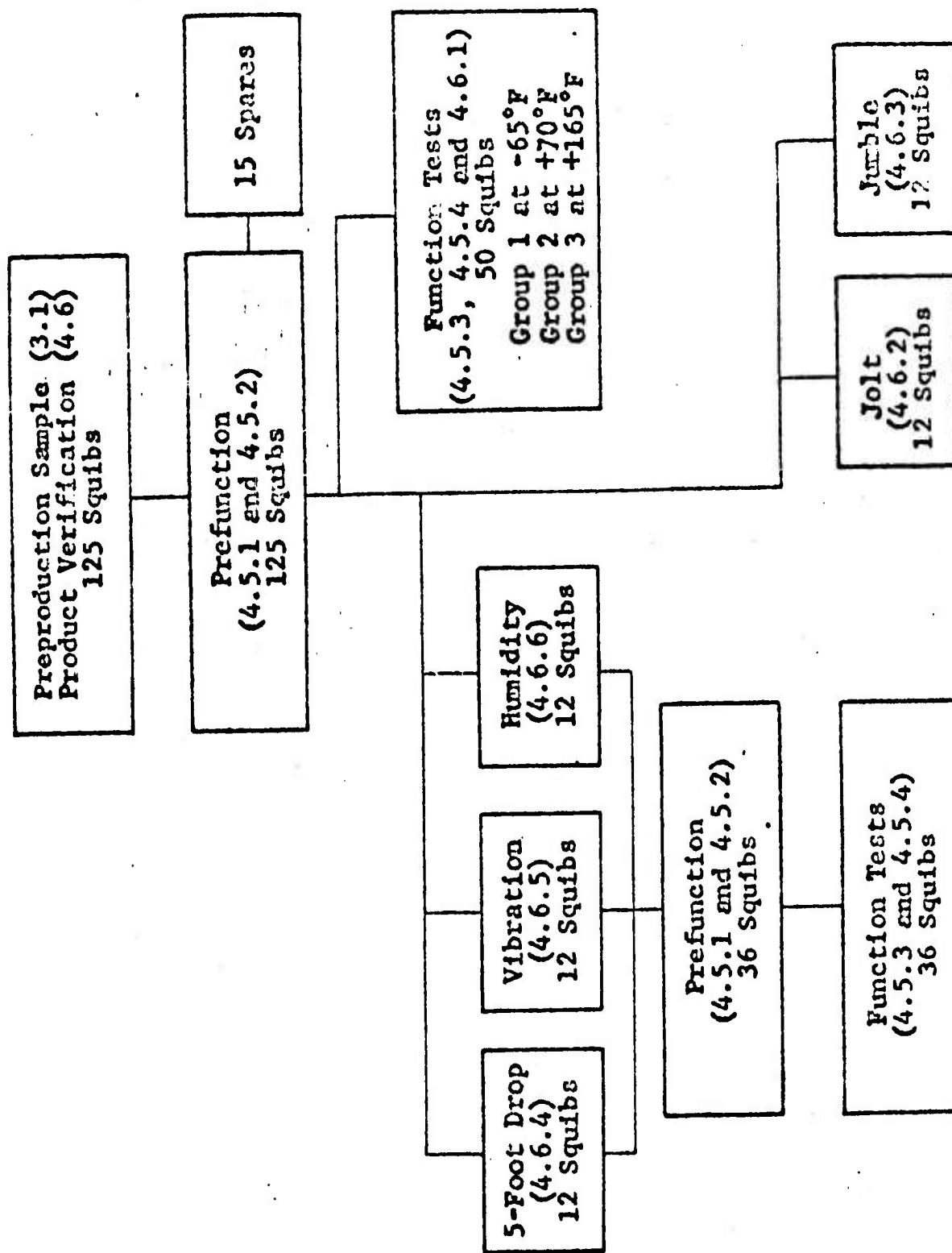


Figure 2. Flow Chart